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Review article – Special issue: Structural heart disease – Aortic and mitral valves

Management of low-gradient aortic stenosis



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ABSTRACT

There is an important proportion of patients with significant aortic stenosis who present with low gradient. In clinical practice we distinguish three subpopulations: (1) “classical” type with low left ventricular ejection fraction, (2) paradoxical type with preserved ventricular ejection fraction and (3) patients with normal flow and low gradient. Differentiation between “true” severe aortic stenosis and pseudostenosis by means of low dose dobutamine stress test is sometimes necessary in order to set further management – operative or conservative respectively. Use of other imaging methods such as MSCT proved also valuable. Intervention of severe aortic stenosis in such cases is considered to be superior with regard to survival, though very high operative risk in some subgroups, typically for patients with low ejection fraction, has been reported.

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Introduction

Degenerative aortic stenosis (AS) has become the most prevalent acquired valvular heart disease that requires intervention in

developed countries. Its incidence increases with age and its prevalence is estimated at the range of 3–7% in population older than 65 years [1]. Over two past decades it had been echocardiography that played central role in diagnosis, grading of

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severity and timing of intervention. It also provides necessary information about left ventricular (LV) function, hypertrophy and presence of other valvular disease. It allows to determine a correct diagnosis of severe AS in most patients based on finding of transvalvular aortic jet velocity of 4 m/s or higher or mean pressure gradient (mPG) of 40 mmHg or higher. In vast majority of cases both correspond to a valve area of less than 1 cm² [2,3]. As the pressure gradient is dependent on transvalvular flow, there is a subset of patients with severe AS with lower mPG secondary to lower transvalvular flow. This situation is usually referred as low flow, low gradient (LF-LG) severe AS that is usually defined by a stroke volume index ≤ 35 ml/m², mPG ≤ 40 mmHg and aortic valve area < 1.0 cm² (or < 0.60 cm²/m²). According to ejection fraction of left ventricle (LVEF) we distinguish two entities of patients with LF-LG: (1) those with preserved LVEF are referred as paradoxical LF-LG severe AS and patient with (2) low LVEF LF-LG severe AS (or “true” LF-LG severe aortic stenosis) (Fig. 1 and Table 1) [4].

Patients with paradoxical LF-LG bear certain analogy to patients with heart failure with preserved LVEF. They often present with severe hypertrophied, non-compliant LV with smaller cavity with reduced filling and restrictive physiology. It is of utmost importance that if the investigations document low-flow state, the underlying reason should be identified and if no obvious cause is found then measurement errors of transvalvular flow should be excluded.

Patients with low-flow low gradient severe aortic stenosis and low LVEF

This entity occurs in 5–10% of all patients with severe AS and is associated with worse outcomes when compared with aortic stenosis and high gradient and/or preserved LV function [5–7]. In symptomatic patients with LF-LG severe AS and low LVEF it is essential to establish whether it is primary LV dysfunction which is caused by other factors than AS or secondary LV which is a consequence of aortic stenosis. The term stenosis is reported as severe (< 1 cm²) though its “true” significance is mild or more often moderate. It happens secondary to lower opening force in the setting of low transvalvular flow [2]. Therefore it may mimic severe AS when area is calculated using continuity equation on echocardiography or Gorlin formula during cardiac catheterization. It has been suggested that low dose (up to 20 μ g/kg/min) dobutamine stress echocardiography (DSE) may be used to assess flow reserve and to distinguish stenosis from pseudostenosis (Fig. 2) [8]. Similarly dobutamine stress test can be performed during invasive cardiac catheterization. It has been acknowledged pseudostenosis does occur in about 30% of patient with low LVEF LF-LG severe AS and patients with pseudostenosis do not benefit from aortic valve intervention. However it does not seem to be case only for patients with low LVEF. It has been

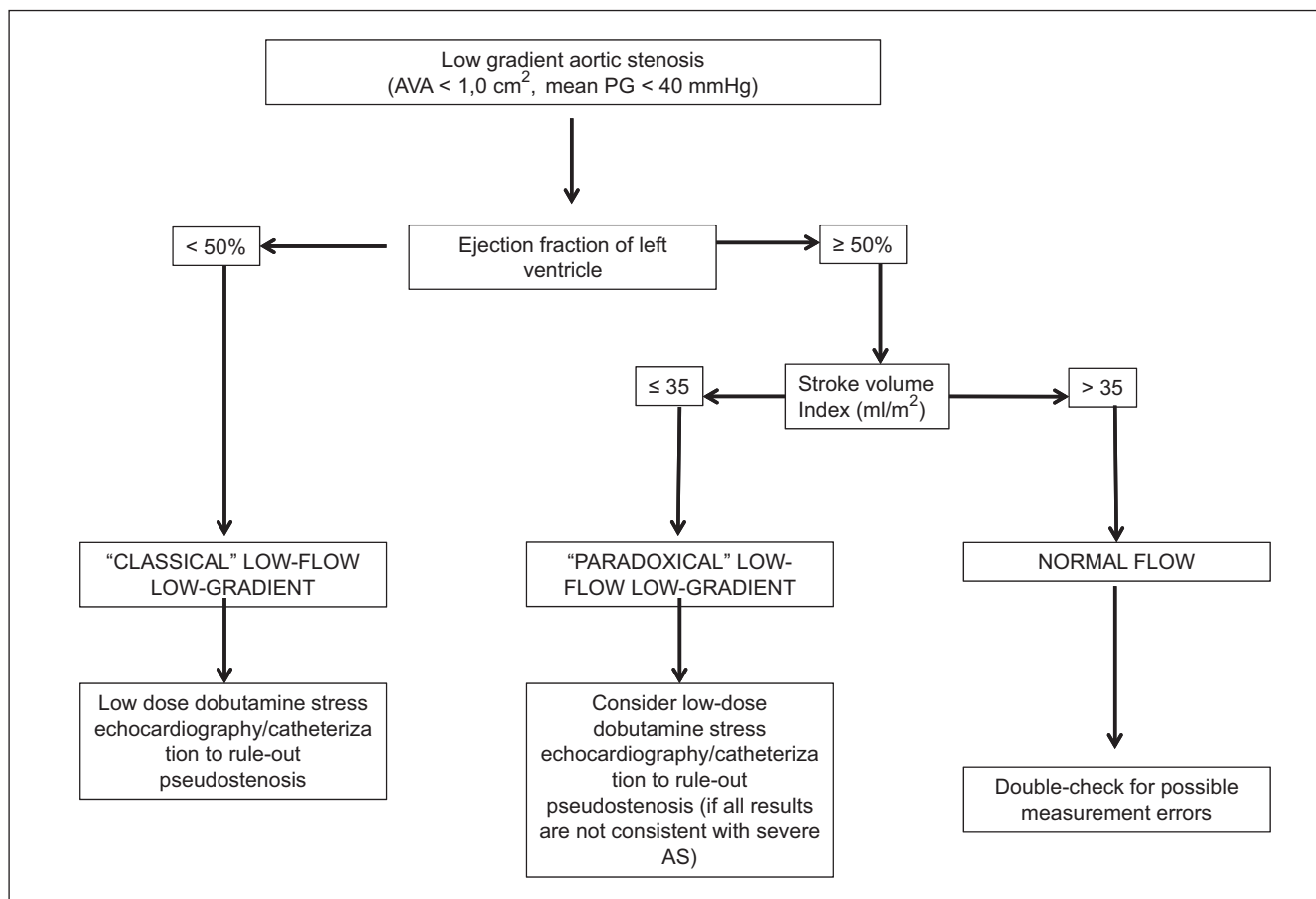


Fig. 1 – Subtypes of low gradient aortic stenosis.

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